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Studies on performance of isabgol (*Plantago ovata* Forsk) genotypes in middle Gujarat conditions

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INTRODUCTION

Isabgol (*Plantago ovata* Forsk) is one of the important medicinal herbs cultivated in 29,891 ha in India, with an annual production of 20,564 tonnes. Its seeds and husk have curative properties and used in Indian System of Medicine. The main production of isabgol comes from North Gujarat and Southern Rajasthan districts. However, Madhya Pradesh and Haryana also have limited area for its cultivation. India is the largest producer and exporter of isabgol seed and husk in the world. During 1996-97, about 9,385 tonnes of husk and 3,426 tonnes of seed were exported valued together Rs 97.93 crores (Anon. 1). Variability in respect to morphological, yield and qualitative traits of isabgol germplasm has been reported (Singh, 9; Bhagat *et al.*, 2; Lal *et al.*, 8). In general, there is a very narrow genetic base. Further, Kalyanasundaram and Dalal (5) found that seed yield had positive and significant correlation with total spikes, effective spikes and tillers/plant. The productivity of isabgol in Gujarat is low due to cultivation of traditional genotypes. Therefore, an attempt was made to evaluate the yield potential of newly identified genotypes under hot, semi-arid agro-ecological regions.

MATERIAL AND METHODS

Ten genotypes were evaluated at the National Research Centre for Medicinal and Aromatic Plants, Anand in a randomized block design with 4 replications. The soil consisted of sandy loam with pH of 7.6 and EC 0.37 ds/m. The plot size was 4.5 × 2.4 m with a row-to-row distance of 45 cm. Sowing was done on 19th of November 1997, and uniform cultural practices as per recommendations of Kalyanasundaram *et al.* (6) were followed. Ten plants from each treatment were randomly selected for recording the growth and yield parameters. Growth parameters such as plant height, days to flower maturity, number of tillers, total spikes, effective spikes/plant, spike length, seed yield/plant and seed yield/ha were recorded and statistically analysed. The crop was harvested on 25th March 1998. For determination of swelling factor of the seed, physical method as described by Dalal and Sriram (4) was followed.

RESULTS AND DISCUSSION

Coefficient of variations (CV) for various growth and yield attributes ranged from 3.69 to 28.43 % (Table 1). Higher CV values were recorded in seed yield/plant and effective spikes/plant, while lower values were noticed in respect to days of flowering and maturity. Positive and highly significant ($P<0.01$) correlations of seed yield/plant with effective spikes/plant ($r = 0.808$), swelling factor ($r = 0.805$), total number of spikes/plant ($r = 0.777$) and seed yield/ha were registered. Thus, these parameters may be suitable criteria while making selections from the population for higher yields in isabgol. These findings are in conformity with the results reported by

Kalyanasundaram and Dalal (5). Variability in morphological and yield attributing characters in isabgol germplasm were reported by Singh (9) and Lal *et al.* (8), but they observed that in general, genetic base of the crop was narrow.

The analysis of variance indicated differences among the genotypes significantly in respect to the characters studied (Table 2). There was not much difference in plant height among the genotypes but significantly higher values were recorded in RI-89 (38.61 cm), RI-87 (38.52cm) and HI-34 (38.43 cm), while least was with HI-5 (30.41 cm). Days to 50% flowering and maturity ranged from 68 to 80 and 111.3 to 124.5 in different genotypes respectively. The genotypes like AMB-29 and HI-5 were early-maturing types and they took about 111-113 days for crop maturity. There was not much difference in tillering behaviour among the genotypes of isabgol and this did not play any significant role in increasing the seed yield. Unlikely, number of spikes and effective tillers/plant showed corresponding increase in seed yield of genotypes. Similar results were also reported by Bhatt (3) and Patel (7). However, these parameters were significantly high in HI-5. Spike length was found to be higher in RI-87 (3.68 cm), RI-89 (3.36 cm) and HI-34 (3.36 cm) and rest were at par. Seed yield/plant varied from 0.56 g to 1.74 g. Maximum seed yield (1.74 g) was recorded in HI-5. Isabgol is valued for its seed and husk yield (total yield) which was significantly higher in HI-5 and HI-1. These varieties were significantly superior to GI-2, the commercial cultivar in Gujarat. Higher yield in HI-5 might be contributed due to its short stature, higher tillering ability, production of more effective tillers and high seed yield/plant. This also confirms that tall and long duration type may not always be beneficial to get higher yield in isabgol and may be used for crop improvement programmes. The quality of husk in isabgol is determined by swelling factor that ranged from 1.92 ml to 2.41 ml in genotypes, which was maximum in HI-5 and least in AMB-29.

SUMMARY

An attempt was made to evaluate the yield potential of newly-identified genotypes under hot, semi-arid agro-ecological regions of Gujarat. Ten

Table 1. Mean, range, coefficient of variation (cv) and correlation of 10 genotypes of isabgol.

Characters	Range	Mean	SD	CV (%)	R
Plant height (cm)	30.41-38.62	35.58	2.58	8.06	0.018
Days to flower (50%)	68.00-80.00	75.23	4.19	5.58	0.073
Days to maturity	111.25-124.50	119.60	4.41	3.69	0.094
Number of tillers/plant	2.62-4.40	3.31	0.63	19.11	0.255
Total No. of spikes/plant	15.82-34.32	22.84	5.97	26.17	0.777**
Effective spikes/plant	8.85-21.55	13.24	3.76	28.40	0.808**
Spike length (cm)	2.75-3.36	3.08	0.30	9.84	0.318
Seed yield/plant(g)	0.56-1.74	1.13	0.32	28.43	-
Seed yield/ha (kg)	388.88-777.77	607.4	120.57	19.90	0.632*
Swelling factor(ml)	1.92-2.41	2.18	0.17	7.96	0.805**

*,** Significant at 5% and 1% level of probability. (= Correlation coefficient between seed yield/plant and other characters).

Table 2. Growth and yield attributes of different genotypes of isabgol.

Genotypes	Plant height (cm)	Days to flowering (50%)	Days to maturity	No of tillers/ plant	Total No. of spikes/ plant	Effective spikes/ plant	Spike length (cm)	Seed yield/ plant (g)	Seed yield/ ha (kg)	Swelling factor (ml)
GI-2	33.16	80.00	124.5	2.42	23.47	14.50	2.75	1.03	611.11	1.97
RI-87	38.52	75.75	120.0	3.25	24.50	13.85	3.68	1.07	685.18	2.22
RI-89	38.61	78.75	121.3	3.05	19.70	11.67	3.36	1.39	592.59	2.37
HI-1	36.83	79.75	124.5	2.62	15.87	10.27	3.09	1.01	722.22	2.24
HI-34	38.43	78.75	123.5	3.62	28.47	13.52	3.36	1.27	629.62	2.35
HI-5	30.41	69.50	113.3	4.40	34.32	21.55	3.07	1.74	777.77	2.41
MI-4	36.71	73.50	119.5	3.55	27.87	16.75	2.88	1.36	518.51	2.19
MIB-121	36.75	74.00	119.5	3.00	18.80	10.05	2.94	1.07	685.18	2.16
AMB-29	33.15	68.00	111.3	3.02	21.55	11.42	2.79	0.86	462.96	1.92
AMB-2	33.28	74.25	118.8	4.17	15.52	8.87	2.84	0.56	388.88	1.99
CD (P=0.05)	2.41	6.51	6.9	1.01	9.56	6.20	0.53	0.53	80.10	0.21

genotypes were evaluated for growth and yield parameters. It was found that effective spikes/plant, swelling factor and total number of spikes/plant were positively correlated with seed yield/plant. AMB - 29 and HI - 5 genotypes were early-maturing types and they took about 111-113 days for crop maturity. HI - 5 and HI - 1 were significantly superior in yield performance to other genotypes. However, maximum seed yield was recorded with HI-5.

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